REMARKS/ARGUMENTS

Claim Rejections – 35 USC § 102

Claims 1,3-8, 12-27 are under 35 U.S.C. 102(e) as being anticipated by Narasimhan (USPN 7,016,651).

Claim 1 refers to a method of estimating noise in an Orthogonal Frequency Division Multiplexing (OFDM) system. The method comprises, *inter alia*,

> receiving OFDM symbols;
> detecting a received power of a signal in an unassigned sub-carrier frequency band; and
> averaging the received power with at least one previously stored received power measurement for the unassigned sub-carrier frequency band.

The Office Action states that Narasimhan teaches a method of estimating noise in an Orthogonal Frequency Division Multiplexing (OFDM) system. According to the Office Action, the method comprises, inter alia, detecting a received power of a signal in an unassigned subcarrier frequency band [Abstract, determining SNR determines power of unassigned subcarrier] and averaging the received power with at least one previously stored received power measurement for the unassigned sub-carrier frequency band [Col. 8, lines 17-47, averaging the power over the number of OFDM symbols and measuring signal quality and performing SNR estimate and averaging on a per symbol basis].

However, Narasimhan does not in fact teach or suggest at least detecting a received power of a signal in an *unassigned* sub-carrier frequency band, or averaging the received power with at least one previously stored received power measurement for the *unassigned* sub-carrier frequency band. On the contrary: Narasimhan teaches "generating an estimate of a geometric SNR (SNRgeo) for the *received* symbols based on an average of the logrithmic difference between soft decision and hard decisions for the *received* symbol." (See Abstract of Narasimhan, emphasis added.) The apparatus in Narasimhan includes a signal-to-noise ratio (SNR) estimation unit to generate an estimate of a geometric SNR *for the OFDM symbol* based on an average of a logrithmic difference between a soft decision and a hard decision *for the OFDM symbol*. See Summary of the Invention, Narasimhan, column 2, lines 22-33, emphasis added. Since the OFDM symbol is all that is used, and since the OFDM symbol is received only on an

assigned sub-carrier, therefore it would appear that Narasimhan uses only the sub-carriers that have been assigned.

The Office Action directs attention to column 8, lines 17-47. However, at column 8, lines 17-47, Narasimhan teaches:

> For example, assume in an 802.11a/g OFDM system, a subset of sub-carriers are selected from a set of sub-carriers. If K=8, meaning that a subset of 8 sub-carriers are used to estimate $SNR_{geo,n}$ a possible regularly spaced subset could include sub-carriers {1, 8, 15, 22, 29, 36, 43, 50} for the nth OFDM symbol in the received frame. Thus, in this case, every 7th sub-carrier is selected for averaging. For the next OFDM symbol n+1, this subset could remain the same, or alternatively, a different subset, partially or fully distinct from the previous subset, may be selected, such as {2, 9, 16, 23, 30, 37, 44, 51}. Of course, this represents only a possible selection strategy to achieve an acceptable SNR_{geo} estimate, either in isolation or over a number of received OFDM symbols or frames, and in fact other selection strategies may be implemented consistent with the present invention as long as a sufficient number of sub-carriers are chosen to provide a representative subset of the symbol constellation. With consideration given to such sub-carrier subset selection, equation (8) becomes:
>
> $$SNR_{geo,n,dB} \approx Avg\left[-20\log_{10}\left|\frac{Y_{n,k}}{H'_{n,k}} - K_{mod}D_{n,k}\right|\right],$$
> k = KO, KI, ... , KK-l, K :;; N.
> This relationship can be conveniently implemented by the SNR estimation unit 235 shown in FIG. 2 to provide an SNR estimate, and consequently a measure of signal quality 5Q on a per received OFDM symbol basis.

This excerpt refers to "the nth OFDM symbol in the received frame" and "a number of received OFDM symbols or frames" as well as "a per received OFDM symbol basis". Applicant respectfully submits that this does not teach or suggest detecting a received power of a signal in an *unassigned* sub-carrier frequency band, or averaging the received power with at least one previously stored received power measurement for the *unassigned* sub-carrier frequency band.

The Office Action also mentions Col. 5, lines 61-67 - Col. 6, lines 1-8; and Col. 12, lines 20-26. However, none of these portions of Narasimhan teaches or suggests using unassigned sub-carriers. Column 5, line 61 begins "After each OFDM symbol is recovered by the FFT 208,..." and thus specifically refers to OFDM symbols. Column 6, lines 1-8 refer to "... each of the sub-carriers (k=1 ... 52) forming the symbol Yn." Column 12, lines 20-26 (within claim 13), refers to "...first and second received symbols..."

Applicant respectfully submits that this rejection should be withdrawn. A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). *See also* MPEP § 2131.

Claim 14 refers to a method of estimating noise in an Orthogonal Frequency Division Multiplexing (OFDM) system. The method comprises, inter alia, "determining an unassigned sub-carrier during the symbol period" and "determining a power, during the symbol period, of a signal in a frequency band corresponding to the unassigned sub-carrier".

For the reasons stated above with respect to Claim 1, Applicant submits that Narasimhan does not teach or suggest at least either "determining an unassigned sub-carrier during the symbol period" and "determining a power, during the symbol period, of a signal in a frequency band corresponding to the unassigned sub-carrier" as set forth in Claim 14. Accordingly, Applicant respectfully requests that this rejection be withdrawn.

Claim 15 refers to an apparatus for estimating noise in an Orthogonal Frequency Division Multiplexing (OFDM) system. The apparatus comprises, *inter alia*, "a processor coupled to the detector and configured to determine an unassigned sub-carrier during the OFDM symbol period," and "to determine a noise estimate based in part on a received power level in a frequency band corresponding to the unassigned sub-carrier".

For the reasons stated above with respect to Claim 1 and Claim 14, Applicant submits that Narasimhan does not teach or suggest at least either "a processor coupled to the detector and configured to determine an unassigned sub-carrier during the OFDM symbol period," or "to determine a noise estimate based in part on a received power level in a frequency band corresponding to the unassigned sub-carrier" as set forth in Claim 15. Accordingly, Applicant respectfully requests that this rejection be withdrawn.

Claim 21 refers to an apparatus for estimating noise in an Orthogonal Frequency Division Multiplexing (OFDM) system. The apparatus comprises, *inter alia*, "processing means, coupled to the means for detecting, for determining an unassigned subcarrier during the OFDM symbol period," and "for determining a noise estimate based in part on a received power level in a frequency band corresponding to the unassigned sub-carrier".

For the reasons stated above with respect to Claim 1, Claim 14, and Claim 15, Applicant submits that Narasimhan does not teach or suggest at least either "a processor coupled to the detector and configured to determine an unassigned sub-carrier during the OFDM symbol period," or "to determine a noise estimate based in part on a received power level in a frequency band corresponding to the unassigned sub-carrier" as set forth in Claim 21 Accordingly, Applicant respectfully requests that this rejection be withdrawn.

Claim 27 refers to a computer-readable medium embodying a program of instructions executable by a processor to perform a method of estimating noise in an Orthogonal Frequency Division Multiplexing (OFDM) system. The method comprises, *inter alia*, "determining an unassigned sub-carrier during the symbol period" and "determining a power, during the symbol period, of a signal in a frequency band corresponding to the unassigned subcarrier".

For the reasons stated above with respect to Claim 1, Claim 14, Claim 15, and Claim 21, Applicant submits that Narasimhan does not teach or suggest at least either "determining an unassigned sub-carrier during the symbol period" or "determining a power, during the symbol period, of a signal in a frequency band corresponding to the unassigned subcarrier" as set forth in Claim 27 Accordingly, Applicant respectfully requests that this rejection be withdrawn.

The remaining claims that are rejected on this ground are dependent claims that depend ultimately from one of these independent claims, and therefore incorporate all of the limitations of the parent claim from which they depend. For these reasons, therefore, Applicant respectfully requests that this rejection be withdrawn with respect to all rejected claims.

Claim Rejections – 35 USC § 103

Claim 9 stands rejected under 35 U.S.c. 103(a) as being unpatentable over Narasimhan (USPN 7,016,651) in view ofVella-Coleiro (USPN 7,197,085).

As stated above, the rejection pertaining to Claim 1 should be withdrawn, and Claim 1 has not been rejected under 35 USC § 103. Claim 1 is therefore allowable. Claim 9 is a dependent claim depending from Claim 1, and therefore Claim 9 includes all of the limitations of the parent claim from which it depends. Accordingly, Applicant respectfully requests that this rejection be withdrawn with respect to all rejected claims.

Claim Rejections – 35 USC § 103

Claim 10 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Narasimhan (USPN 7,016,651) in view of Jones et al. (USPN 6,757,241).

As stated above, the rejection pertaining to Claim 1 should be withdrawn, and Claim 1 has not been rejected under 35 USC § 103. Claim 1 is therefore allowable. Claim 10 is a dependent claim depending from Claim 1, and therefore Claim 10 includes all of the limitations of the parent claim from which it depends. Accordingly, Applicant respectfully requests that this rejection be withdrawn with respect to all rejected claims.

Claim Rejections – 35 USC § 103

Claim 11 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Narasimhan (USPN 7,016,651) in view of Jones et al. (USPN 6,757,241) as applied to claim 10 above, and further in view of Crawford (USPN 6,549,561).

As stated above, the rejection pertaining to Claim 1 should be withdrawn, and Claim 1 has not been rejected under 35 USC § 103. Claim 1 is therefore allowable. Claim 11 is a dependent claim depending from Claim 1, and therefore Claim 11 includes all of the limitations of the parent claim from which it depends. Accordingly, Applicant respectfully requests that this rejection be withdrawn with respect to all rejected claims.
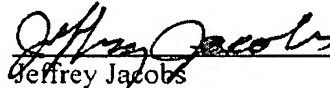
CONCLUSION

In light of the amendments contained herein, Applicants submit that the application is in condition for allowance, for which early action is requested.

Please charge any fees or overpayments that may be due with this response to Deposit Account No. 17-0026.

Respectfully submitted,

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